



# Information technology — Dynamic adaptive streaming over HTTP (DASH) —

## Part 1: Media presentation description and segment formats

### TECHNICAL CORRIGENDUM 2

*Technologies de l'information — Diffusion en flux adaptatif dynamique sur HTTP (DASH) —*

*Partie 1: Description de la présentation et formats de remise des médias*

*RECTIFICATIF TECHNIQUE 2*

Technical Corrigendum 2 to ISO/IEC 23009-1:2013 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology, Subcommittee SC 29, Coding of audio, picture, multimedia and hypermedia information.*

#### Replace in Table 3

|                |   |   |
|----------------|---|---|
| @minBufferTime | M | specifies a common duration used in the definition of the Representation data rate (see @bandwidth attribute in 5.3.5.2). |
|----------------|---|---|

#### with

|                |   |   |
|----------------|---|---|
| @minBufferTime | M | specifies a common duration used in the definition of the Representation data rate (see @bandwidth attribute in 5.3.5.2 and 5.3.5.4). |
|----------------|---|---|

Replace in Table 7

|            |   |  |
|------------|---|--|
| @bandwidth | M | Consider a hypothetical constant bitrate channel of bandwidth with the value of this attribute in bits per second (bps). Then, if the Representation is continuously delivered at this bitrate, starting at any SAP that is indicated either by @startWithSAP or by any Segment Index box, a client can be assured of having enough data for continuous playout providing playout begins after @minBufferTime * @bandwidth bits have been received (i.e. at time @minBufferTime after the first bit is received). For dependent Representations this value specifies the bandwidth according to the above definition for the aggregation of this Representation and all complementary Representations. |
|------------|---|--|

with

|            |   |  |
|------------|---|--|
| @bandwidth | M | Consider a hypothetical constant bitrate channel of bandwidth with the value of this attribute in bits per second (bps). Then, if the Representation is continuously delivered at this bitrate, starting at any SAP that is indicated either by @startWithSAP or by any Segment Index box, a client can be assured of having enough data for continuous playout providing playout begins after @minBufferTime * @bandwidth bits have been received (i.e. at time @minBufferTime after the first bit is received). For dependent Representations this value specifies the bandwidth according to the above definition for the aggregation of this Representation and all complementary Representations.<br>For details see 5.3.5.4. |
|------------|---|--|

**Add section 5.3.5.4 Relation of Bandwidth and Minimum Buffer Time attributes**

The MPD contains a pair of values for a bandwidth and buffering description, namely the Minimum Buffer Time (MBT) expressed by the value of `MPD@minBufferTime` and bandwidth (BW) expressed by the value of `Representation@bandwidth`. The following holds:

- — the value of the minimum buffer time does not provide any instructions to the client on how long to buffer the media. The value however describes how much buffer a client should have under ideal network conditions. As such, MBT is not describing the burstiness or jitter in the network, it is describing the burstiness or jitter in the content encoding. Together with the BW value, it is a property of the content. Using the "leaky bucket" model, it is the size of the bucket that makes BW true, given the way the content is encoded.
- — The minimum buffer time provides information that for each representation, the following shall be true: If the Representation (starting at any segment) is delivered over a constant bitrate channel with bitrate equal to value of the BW attribute then each access unit with presentation time *PT* is available at the client latest at time with a delay of at most *PT + MBT*.
- — In the absence of any other guidance, the `MBT` should be set to the maximum GOP size (coded video sequence) of the content, which quite often is identical to the maximum segment duration for the live profile or the maximum subsegment duration for the On-Demand profile. The `MBT` may be set to a smaller value than maximum (sub)segment duration, but should not be set to a higher value.

**Add the following section****A.9: Usage of Bandwidth and Minimum Buffer Time in DASH client**

In a simple and straightforward implementation, a DASH client decides downloading the next segment based on the following status information:

- the currently available buffer in the media pipeline, *buffer*
- the currently estimated download rate, *rate*
- the value of the attribute @minBufferTime, *MBT*
- the set of values of the @bandwidth attribute for each Representation *i*, *BW[i]*

The task of the client is to select a suitable Representation *i*.

The relevant issue is that starting from a SAP on, the DASH client can continue to playout the data. This means that at the current time it does have *buffer* data in the buffer. Based on this model the client can download a Representation *i* for which  $BW[i] \leq rate * buffer / MBT$  without emptying the buffer.

Note that in this model, some idealizations typically do not hold in practice, such as constant bitrate channel, progressive download and playout of Segments, no blocking and congestion of other HTTP requests, etc. Therefore, a DASH client should use these values with care to compensate such practical circumstances; especially variations in download speed, latency, jitter, scheduling of requests of media components, as well as to address other practical circumstances.

One example is if the DASH client operates on Segment granularity. As in this case, not only parts of the Segment (i.e., *MBT*) needs to be downloaded, but the entire Segment, and if the *MBT* is smaller than the Segment duration, then rather the segment duration needs to be used instead of the *MBT* for the required buffer size and the download scheduling, i.e. download a Representation *i* for which  $BW[i] \leq rate * buffer / max\_segment\_duration$ .

**In Section 7.1**

**Replace the Note**

NOTE Representation metadata present in the MPD may also be repeated in the media streams, e.g. in an Initialization Segment or a Media Segment. The Media Presentation shall be provided such that no mismatch between these two values occurs. If it does, the value in the media stream itself takes precedence over values expressed in the MPD, especially when used in the media decoding process.

**With**

NOTE Representation metadata present in the MPD may also be repeated in the media streams, e.g. in an Initialization Segment or a Media Segment. The Media Presentation **should** be provided such that no mismatch between these two values occurs. If it does, the value in the media stream itself takes precedence over values expressed in the MPD, especially when used in the media decoding process. **In addition, it should be considered that metadata in the MPD is primarily used for selection of Representations by the DASH client, whereas data in the media stream is used by the media decoder in order to establish the decoding and rendering process. Metadata in the MPD should only be added if the Media Presentation author expects that the DASH client can make use of this information in the selection process.**

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## Replace in Table 7

|     |   |  |
|-----|---|--|
| @id | O | specifies an identifier for this media component. The attribute shall be unique in the scope of the containing Adaptation Set. |
|-----|---|--|

## With

|     |   |   |
|-----|---|---|
| @id | O | <p>specifies an identifier for this media component. The attribute shall be unique in the scope of the containing Adaptation Set.</p> <p>The value of this attribute should be the media component identifier in the media segment (i.e., the Track Id in ISOBMFF segments and PID in MPEG-2 TS segments) described by this ContentComponent element.</p> |
|-----|---|---|

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**Add at the end of 5.8.4.8 Essential Property Descriptor**

The removal of an EssentialProperty descriptor in an MPD shall not change the conformance of this MPD to its associated schema and profile.

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In Table 17 replace

|   |        |   |
|---|--------|---|
| s | 1 .. N | specifies Segment start time and duration for a contiguous sequence of segments of identical durations. The textual order of the s elements must match the indexed (and thus time) order of the corresponding Media Segments. |
|---|--------|---|

With

|   |        |   |
|---|--------|---|
| s | 1 .. N | <p>specifies Segment start time and duration for a contiguous sequence of segments of identical durations, referred to as series in the following.</p> <p>The textual order of the s elements must match the indexed (and thus time) order of the corresponding Media Segments.</p> <p>Note: the sequence of s parameters is defined by the @t semantics.</p> |
|---|--------|---|

In Table 17 replace

|    |   |   |
|----|---|---|
| @t | O | <p>specifies the MPD start time, in @timescale units, the first Segment in the series starts relative to the beginning of the Period.</p> <p>The value of this attribute shall be equal to or greater than the sum of the previous s element earliest presentation time and the sum of the contiguous Segment durations.</p> <p>If the value of the attribute is greater than what is expressed by the previous s element, it expresses discontinuities in the timeline.</p> <p>If not present then the value shall be assumed to be zero for the first s element and for the subsequent s elements, the value shall be assumed to be the sum of the previous s element's earliest presentation time and contiguous duration (i.e. previous <math>s_{@t} + @d * (@r + 1)</math>).</p> |
|----|---|---|

With

|    |   |  |
|----|---|--|
| @t | O | <p>specifies the MPD start time, in @timescale units, of the first Segment in the series relative to the beginning of the Period.</p> <p>The value of this attribute must be equal to or greater than the sum of the previous s element earliest presentation time and the sum of the contiguous Segment durations.</p> <p>If the value of the attribute is greater than what is expressed by the previous s element, it expresses discontinuities in the timeline.</p> <p>If not present then the value shall be assumed to be zero for the first s element and for the subsequent s elements, the value shall be assumed to be the sum of the previous s element's earliest presentation time and contiguous duration (i.e. previous <math>s_{@t} + @d * (@r + 1)</math>).</p> |
|----|---|--|

**Replace**

**5.8.4.1 Content protection**

For the element **ContentProtection** the `@schemeIdUri` attribute is used to identify a content protection scheme. This attribute should provide sufficient information, possibly in conjunction with the `@value` and/or extension attributes and elements, such as the DRM system(s), encryption algorithm(s), and key distribution scheme(s) employed, to enable a client to determine whether it can possibly play the protected content. The **ContentProtection** element can be extended in a separate namespace to provide information specific to the content protection scheme (e.g., particular key management systems or encryption methods).

When the **ContentProtection** element is not present the content shall not be content-protected.

When multiple **ContentProtection** elements are present, each element shall describe a content protection scheme that is sufficient to access and present the Representation.

**With**

**5.8.4.1 Content protection**

For the element **ContentProtection**, the `@schemeIdUri` attribute is used to identify a content protection **descriptor** scheme.

The **ContentProtection** **Descriptors** should provide sufficient information, possibly in conjunction with the `@value` and/or extension attributes and elements, such as the DRM system(s), encryption algorithm(s), and key distribution scheme(s) employed, to enable a client to determine whether it can possibly play the protected content.

The **ContentProtection** element can be extended in a separate namespace to provide information specific to a content protection scheme (e.g., particular key management systems or encryption methods).

When **no** **ContentProtection** element is **not** present the content shall not be **encrypted**.

When multiple **ContentProtection** elements are present with **different SystemID values**, each element shall describe a **key management and protection scheme** that is sufficient to access and present the Representation.

**In Table 3 replace**

|                      |   |   |
|----------------------|---|---|
| @minimumUpdatePeriod | O | <p>If this attribute is present, it specifies the smallest period between potential changes to the MPD. This can be useful to control the frequency at which a client checks for updates.</p> <p>If this attribute is not present it indicates that the MPD does not change.</p> <p>If <b>MPD@type</b> is 'static', @minimumUpdatePeriod shall not be present.</p> <p>Details on the use of the value of this attribute are specified in 5.4.</p> |
|----------------------|---|---|

**With**

|                      |   |   |
|----------------------|---|---|
| @minimumUpdatePeriod | O | <p>If this attribute is present, it specifies the smallest period between potential changes to the MPD. This can be useful to control the frequency at which a client checks for updates.</p> <p>From a client perspective, after a client fetches an MPD, it specifies the minimum period during which the MPD remains valid. Validity is defined in 5.4.</p> <p>If this attribute is not present it indicates that the MPD does not change.</p> <p>If <b>MPD@type</b> is not 'dynamic', @minimumUpdatePeriod shall not be present.</p> <p>Details on the use of the value of this attribute are specified in 5.4.</p> |
|----------------------|---|---|

**In 5.4 Media Presentation Description updates replace**

Otherwise, let  $Texp(i)$  be the sum of the value of **MPD@minimumUpdatePeriod** and the wall-clock time at which the  $i$ -th version of the MPD is updated (and replaced with the  $(i+1)$ -th version).

**with**

Otherwise, let  $Texp(i)$  be the sum of the value of **MPD@minimumUpdatePeriod** and the wall-clock time at which the  $i$ -th version of the MPD is updated (and replaced with the  $(i+1)$ -th version) **at the location where the MPD is available**.

In section G.8 replace

```

<MPD>
  <Period>
    <AdaptationSet mimeType="video/mp4" group="1"/>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main"/>
      <Viewpoint schemeIdUri="urn:mpeg:dash:viewpoint:2011" value="vp1"/>
      <Representation id="11" bandwidth="1024000">...</Representation>
      <Representation id="12" bandwidth="512000">...</Representation>
      ...
    </AdaptationSet>

    <AdaptationSet mimeType="video/mp4" group="1"/>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main"/>
      <Viewpoint schemeIdUri="urn:mpeg:dash:viewpoint:2011" value="vp2"/>
      <Representation id="11" bandwidth="1024000">...</Representation>
      <Representation id="12" bandwidth="512000">...</Representation>
      ...
    </AdaptationSet>

    <AdaptationSet mimeType="audio/mp4" group="1"/>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main"/>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="supplementary"/>
      <Viewpoint schemeIdUri="urn:mpeg:dash:viewpoint:2011" value="vp1"/>
      <Representation id="11" bandwidth="1024000">...</Representation>
      <Representation id="12" bandwidth="512000">...</Representation>
      ...
    </AdaptationSet>

    <AdaptationSet mimeType="audio/mp4" group="1"/>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main"/>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="supplementary"/>
      <Viewpoint schemeIdUri="urn:mpeg:dash:viewpoint:2011" value="vp2"/>
      <Representation id="11" bandwidth="1024000">...</Representation>
      <Representation id="12" bandwidth="512000">...</Representation>
      ...
    </AdaptationSet>

  </Period>
  ...
</MPD>

```